NIE 11-5-58
19 August 1958
034640

~~TOP SECRET~~

Nº 259

NATIONAL INTELLIGENCE ESTIMATE

NUMBER 11-5-58

(Supersedes NIE 11-5-57, SNIE 11-10-57
and portions of NIE 11-4-57)

SOVIET CAPABILITIES IN GUIDED MISSILES AND SPACE VEHICLES

CONCLUSIONS

(The full text of this estimate is
being published separately)

Submitted by the

DIRECTOR OF CENTRAL INTELLIGENCE

The following intelligence organizations participated in the preparation of this estimate: The Central Intelligence Agency and the intelligence organizations of the Departments of State, the Army, the Navy, the Air Force, The Joint Staff, and the Atomic Energy Commission.

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SOVIET CAPABILITIES IN GUIDED MISSILES AND SPACE VEHICLES[1]

THE PROBLEM

To estimate Soviet capabilities and probable programs for the development of guided missiles and space vehicles, including earth satellites, through 1966,[2] and to analyze factors affecting Soviet operational capabilities in these fields.

FOREWORD

This estimate supersedes NIE 11-5-57, SOVIET CAPABILITIES AND PROBABLE PROGRAMS IN THE GUIDED MISSILE FIELD, 12 March 1957, and SNIE 11-10-57, THE SOVIET ICBM PROGRAM, 10 December 1957, as well as those paragraphs dealing with guided missiles (paras. 108 through 114) in NIE 11-4-57, MAIN TRENDS IN SOVIET CAPABILITIES AND POLICIES, 1957-1962, 12 November 1957. The new estimate, like its predecessors, is made in the light of our previous judgments that the USSR does not now intend to initiate general war deliberately and is not now preparing for general war as of any particular future date. It also assumes that through 1966 there will be no international agreements on the control of armaments or of outer space.

The estimate is intended primarily to reassess and update our estimates of probable Soviet missile development programs, missile characteristics, and first operational capability dates. Some discussion is provided on factors likely to affect Soviet acquisition of substantial operational capabilities with missile systems, and Soviet capabilities to place various arbitrarily-selected quantities of ICBMs in operational use are estimated. The reader is cautioned that Annex A of NIE 11-5-57 is no longer applicable.

For the most part, changes in estimated missile characteristics and first operational capability dates result from the accumulation over the past year of a considerable body of new evidence. Of the 13 missile systems estimated as probably available for operational use in 1958 or earlier, we now have direct evidence on the existence of nine; we also have direct evidence on Soviet development of an ICBM.

[1] The title of this estimate, when used separately from the text, is classified CONFIDENTIAL.

[2] For comparability with earlier estimates on this subject, the terminal date chosen for this estimate is the same as that of its predecessor, NIE 11-5-57, SOVIET CAPABILITIES AND PROBABLE PROGRAMS IN THE GUIDED MISSILE FIELD, 12 March 1957.

For some of these systems the evidence is extensive, while for others we have only limited information relative to characteristics and components. Serious intelligence gaps remain, particularly with respect to the operational status of various systems. Furthermore, we do not have sufficient evidence available on which to base an estimate of the vulnerability of Soviet systems to specific electronic countermeasures.

In making this estimate in a field where positive intelligence remains limited, we have considered the available evidence in the light of estimated Soviet military requirements, known and estimated Soviet capabilities in related fields, and US guided missile experience. The entire study rests upon our belief, now well-supported by evidence, that a concerted and continuous Soviet research and development effort in guided missiles was underway by 1948.

For guided missiles, except where noted otherwise, the operational capability dates given are the earliest years during which we believe missiles could probably have been placed in the hands of trained personnel in one operational unit, thus constituting a limited capability for operational employment. We estimate that when they first become operational, the missile systems discussed herein will have a system reliability of 40–60 percent, and that improvement will occur thereafter.[3] For space flight activities, the dates given are the earliest *possible* time periods by which we believe each specific accomplishment could be achieved.

SUMMARY AND CONCLUSIONS

1. The USSR has continued to press ahead with its extensive guided missile research and development, generally along the lines indicated in our previous estimates. As a result of this effort, the USSR now has available for operational use a variety of missile systems. Soviet achievements in ballistic missiles have been especially impressive and have contributed to early successes in the USSR's space flight program. Substantial success in developing surface-to-air missile systems has also been achieved. Available evidence is not sufficient to indicate equal emphasis and similar success in other Soviet missile programs.

2. By itself, each of the guided missile or space programs estimated as a future development appears feasible both as to technical achievability and date attainable. However, some programs may be slowed or even halted by the competition of other missile or non-missile delivery systems, unforeseen development or production difficulties, rapidity of obsolescence, changing military requirements, and/or broad considerations of Soviet national policy. On the other hand, a significant advance in one or more of the programs might be possible if a scientific breakthrough is achieved.

3. *Surface-to-surface missiles.* We believe that the Soviet ballistic missile development program has emphasized reliability and simplicity, rather than minia-

[3] The term "system reliability" is here defined as the percentage of missiles which function according to specifications from missile launching to detonation in the target area, excluding malfunctions prior to launching.

turization or extreme refinement of design. System mobility appears to have been a basic consideration since the early developmental stages. In developing longer-range systems, maximum use has been made of proven components.

4. Since 1954 the USSR has probably had available for operational use ballistic missiles with maximum ranges of about 100 nautical miles (n.m.), 200 n.m. and 350 n.m. We believe that, depending upon various operational factors, nuclear, high explosive (HE) or chemical (CW) warheads would be used with these missiles.[4] In addition, the USSR probably now has operational a very short range anti-tank missile equipped with shaped-charge HE warhead.

5. An extensive Soviet program to develop a 700 n.m. ballistic missile is indicated by a long series of test firings, averaging about two per month since 1955. We estimate that this missile probably became operational in 1956. On the basis of about a dozen test firings over the past year, we estimate that the USSR will also probably have operational in 1958 a modification of the 700 n.m. missile, capable of an 1,100 n.m. range. Nuclear warheads would almost certainly be used in both these missiles, although we do not exclude the possibility of CW use in the 700 n.m. missile.

6. *Intercontinental ballistic missile (ICBM).* Since August 1957, the USSR has test fired at least four and possibly six missiles to a distance of approximately 3,500 nautical miles. We believe this represents the development of an ICBM system which, when first operational, will probably be capable of delivering a nuclear payload to a maximum range of about 5,500 n.m., with an accuracy (CEP) of 5 n.m. and a system reliability of about 50 percent. By the early 1960's reliability will probably be considerably improved. At the beginning of the period 1962–1966, the CEP could be about 3 n.m., and could be reduced to about 2 n.m. later in the period.

7. Available evidence is inconclusive as to the designed payload-carrying capacity of the Soviet ICBM, which we have previously estimated as about 2,000 pounds. Recent evidence and re-analysis may indicate that the USSR is developing an ICBM with a 5,000 pound payload. Serious logistical and operational problems are associated with missiles of the sizes necessary to deliver 2,000 or 5,000 pounds to a range of 5,500 n.m.; these problems would be greater in the case of the heavier payload. In the light of this consideration, we estimate that the Soviet ICBM is designed to carry a nuclear payload of about 2,000 pounds, although there is a possibility that it is designed to carry about 5,000 pounds.

8. The USSR will probably have a first operational capability with ten prototype ICBMs at some time during calendar 1959; the possibility should not be disregarded, however, that in the latter part of 1958 the USSR may establish an ICBM capability with missiles comparatively unproven as to accuracy and reliability.

9. We believe that Soviet planners intend to achieve a sizeable ICBM operational capability at the earliest practicable date, although we have no direct evidence on

[4] Estimated nuclear warhead capabilities for these and other missiles discussed in this estimate are given in Annex C (limited distribution under separate cover).

Soviet preparations for ICBM production and deployment. We estimate that the USSR has the technical and industrial capability to produce ICBMs, complete launching facilities, establish logistic lines and train troops at a rate sufficient to have an operational capability with 100 ICBMs [5] about one year after its first operational capability date (i.e. some time in 1960), and with 500 ICBM's [5] two or at most three years after first operational capability date (i.e. some time in 1961, or at the latest in 1962). This implies that the USSR could achieve an operational capability with ten or more, but less than 100 ICBMs by the end of 1959, depending upon when during the calendar year the first operational capability is achieved.

10. *Surface-to-air-missiles.* For several years the USSR has had in operational use a fixed surface-to-air system which we believe is now capable of employment against aircraft at ranges up to 20–30 n.m., with greatest effectiveness at altitudes of 30,000 to 60,000 feet. This system is known to be employed in a dense and costly complex of 56 sites around Moscow; targets of lesser importance will probably be provided with considerably less elaborate surface-to-air missile defenses. We believe the Soviets also have available for operational use a surface-to-air missile with similar characteristics, except for improved capability to intercept small, supersonic targets. It is probably suitable for employment either with the Moscow system or with a semi-mobile system.

[5] These numbers are selected arbitrarily in order to provide some measure of the Soviet capacity to produce and deploy ICBMs; they do *not* represent an estimate of probable Soviet requirements or stockpiles.

11. Neither of the above systems is likely to be effective against very low altitude attack. We therefore estimate that the USSR is developing and will probably have in operation in 1959–1960 a surface-to-air system with a maximum range of about 15 n.m., effective at altitudes from 50 feet to at least 40,000 feet. We estimate that for improved defense of critical areas, the USSR will probably have available in 1960–1961 a surface-to-air system with effectiveness at altitudes up to 90,000 feet and a maximum range of 75–100 n.m.

12. We estimate that in 1963–1966 the Soviets will probably achieve a first operational capability with a surface-to-air system of limited effectiveness against ICBMs. Such a system could possibly have some effectiveness against IRBMs. A surface-to-air system with limited capability to counter reconnaissance satellites could and possibly will be developed for use in 1960–1964; a more sophisticated system could be integrated with an anti-ballistic missile system at a later date.

13. *Air-to-air missiles.* Three short-range systems which employ HE warheads are now estimated as operational. Two are believed to have radar guidance with ranges of 5–6 n.m.; the other, with a range of up to 2½ n.m., is believed to use infrared guidance. Most currently operational Soviet fighter aircraft types could be modified to employ these missiles. In 1960 the USSR will probably have available a 15–20 n.m. air-to-air missile.

14. *Air-to-surface missiles.* The present operational system is capable of carrying a nuclear or HE warhead at subsonic speed to a range of about 55 n.m. against well-defined targets, such as ships. With dif-

ferent guidance, the system could be employed against land targets. We estimate that the USSR is probably developing and may now have operational an air-launched decoy to simulate medium or heavy bombers. We believe that the USSR will probably develop and have operational in 1960–1961 a supersonic missile with improved guidance and a range of at least 100 n.m., suitable for employment against a wide variety of targets.

15. *Naval-launched missiles.* The Soviet navy probably now has the capability to launch subsonic cruise-type missiles from a few converted submarines of conventional design, although there is little direct evidence of submarine-launched missile development in the USSR. We estimate that the current system could deliver nuclear warheads against land targets within about 200 n.m. of the launching submarine. These cruise-type missiles could be launched by a submarine only after surfacing. We believe, however, that in 1961–1963 the USSR will probably have a submarine-launched ballistic missile system available for first operational use in a prototype submarine of new design. This system will probably be capable of delivering a nuclear warhead from a submerged submarine to a range of about 1,000 n.m.

16. We estimate that during 1959–1960 the USSR will begin equipping its surface fleet with surface-to-air missiles having a maximum range of 20 n.m., with effectiveness at altitudes from 50 feet to at least 40,000 feet. A Soviet shipborne surface-to-air system for use against targets at higher altitudes and longer ranges will probably become available in 1960–1961. These systems, while primarily for air defense, could be modified for employment against surface targets. Late in the period of this estimate, the USSR will probably also have available a missile system for use in anti-submarine warfare.

17. *Soviet space programs.* We believe that the ultimate foreseeable objective of the Soviet space program is the attainment of manned interplanetary travel. The program is supported by extensive Soviet research efforts in a number of related fields, including rocket propulsion, electronics, space medicine, astrobiology, astrophysics and geophysics. Present activities appear to be directed toward the collection of scientific data and experience applicable to future space accomplishments, the ICBM program, and basic scientific research. Soviet requirements for space vehicles have probably been established for fairly specific scientific and/or military purposes in accordance with a planned step-by-step progression.

18. Soviet success in ballistic missile development and earth satellite launchings to date leads us to estimate a considerable Soviet capability for early accomplishments in space including: surveillance satellites, recoverable aeromedical satellites, lunar probes and impacts, lunar satellites and planetary probes to Mars and Venus (1958–1959); "soft landings" by lunar rockets and recoverable manned earth satellites (1959–1960); a manned glide-type high altitude research vehicle (1960–1961); heavy earth satellites and manned circumlunar flights (1961–1962); and manned lunar landings (after 1965). While each individual achievement appears feasible as to technical capability and earliest date attainable, we doubt that the USSR can accomplish all of these space flight activities within the time periods specified.

SIMPLIFIED TABULAR SUMMARY[1]

Probable Soviet Guided Missile Development Program

Arbitrary Designation	Operational Date	Maximum Range	Payload Weight and Type	Design Altitude
Ground-Launched Ballistic Missiles				
SS–1 *	1954	100 n.m.	1,500 lbs. Nuclear, HE, CW	———
SS–2 *	1954	200 n.m.	2,000 lbs. Nuclear, HE, CW	———
SS–3 *	1954	350 n.m.	Up to 5,000–6,000 lbs. Nuclear, HE, CW	———
SS–4 *	1956	700 n.m.	Up to 5,000–6,000 lbs. Nuclear, poss. CW	———
SS–5 *	1958	1,100 n.m.	Up to 3,000 lbs. Nuclear	———
SS–6 ICBM *	1959	5,500 n.m.	2,000 lbs., poss. 5,000 lbs. Nuclear	———
Ground-Launched Anti-Tank Missile				
SS–a. t.	prior to 1958	6,000 yards	20–40 lbs. HE	———
Submarine-Launched Missiles				
SS–7 cruise-type	1955–56	200 n.m.	2,000 lbs. Nuclear	———
SS–8 ballistic	1961–63	1,000 n.m.	1,000 lbs. Nuclear	———
Ground-Launched Surface-to-Air Missiles				
SA–1 *	1954	20–30 n.m.	500–800 lbs.[2]	30,000–60,000 ft.
SA–2 *	1957	15–30 n.m.	500–700 lbs.[2]	20,000–60,000 ft.
SA–3	1959–60	15 n.m.	150–250 lbs.[2]	50 ft.–40,000 ft.
SA–4	1960–61	75–100 n.m.	500 lbs.[2]	Up to 90,000 ft.
SA–5	1963–66	limited effectiveness against ICBMs		
Shipborne Surface-to-Air Missiles				
SA–6	1959–60	20 n.m.	150–250 lbs.[2]	50 ft.–40,000 ft.
SA–7	1960–61	75–100 n.m.	500 lbs.[2]	Up to 90,000 ft.
Air-to-Air Missiles				
AA–1 *	1955–56	5 n.m.	70 lbs. HE	———
AA–2	1955–56	2½ n.m.	25 lbs. HE	———
AA–3	1958	6 n.m.	50 lbs. HE	———
AA–4	1960	15–20 n.m.	150 lbs.[2]	———
Air-to-Surface Missiles				
AS–1 *	1956–57	55 n.m.	3,000 lbs. Nuclear, HE	———
AS–2	1960–61	100 n.m.	3,000 lbs. Nuclear	———

[1] Detailed summaries of each missile category, including all estimated characteristics and other pertinent data, are presented in Tables 1–5 in Annex A. A summary of estimated Soviet capabilities in space flight is presented in Table 6.

[2] Nuclear warheads would increase the kill probabilities achievable with these missiles and will be required for effective use of the missiles under some conditions. However, HE warheads will be effective in most applications.

* Those missile types for which our estimates are supported by significant current intelligence are indicated by an asterisk following the missile designation.

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